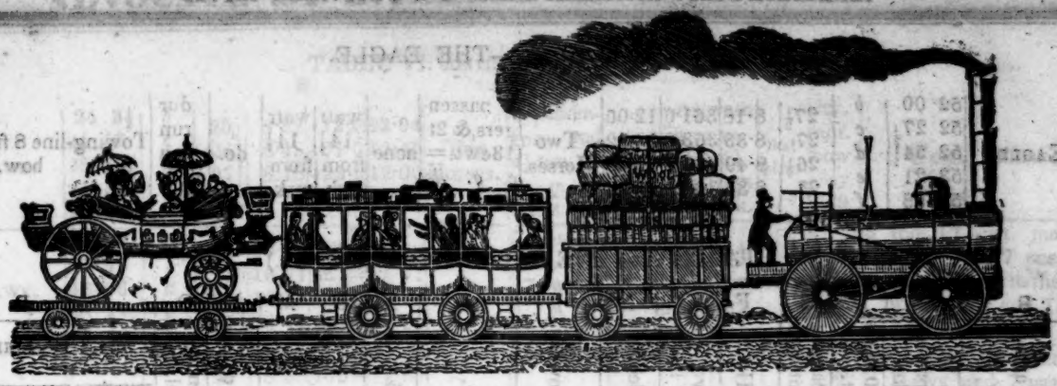

AMERICAN RAILROAD JOURNAL,
AND ADVOCATE OF INTERNAL IMPROVEMENTS:

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D. K MINOR, and GEORGE C. SCHAEFFER, } EDITORS AND PROPRIETORS.] SATURDAY, APRIL 29, 1837. VOLUME VI—No. 17.

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AMERICAN RAILROAD JOURNAL.

NEW-YORK, APRIL 29, 1837.

REMOVAL.—The Office of the RAILROAD JOURNAL, NEW-YORK FARMER, and MECHANIC'S MAGAZINE, is removed to No. 30 WALL-STREET, *basement story*, one door from William street, and *opposite the Bank of America.*

☞ SUBSCRIBERS IN THIS CITY, who change their residence on the 1st of May, will please give notice at the office, 30 Wall-street, *Basement Story.* It is desirable that the notice should specify their late and future residence.

We ask attention to the following notice of Professor Hackley.

A COURSE OF INSTRUCTION IN CIVIL ENGINEERING, by informal lectures, to occupy two months, commencing the 1st week of May.—Comprising

The use of the theodolite, level, Compass plain table, cross, and sextant explained upon the instruments themselves: topographical drawing executed under supervision; survey of routes; problems of excavation and embankment; railroad curves; all the usual details of construction upon common roads, railroads, and canals; including bridges, culverts, tunnels, and the various kinds of motive power; nature, strength and stress of materials; masonry, carpentry and constructions in iron; alluvial deposites, guaging of streams, &c.—The whole purely elementary. Terms of admission to the course, $20.

Apply to C. W. Hackley, Professor of Mathematics in the University, 32 Waverly Place.

To the Editors of the R. R. Journal.

NEW-YORK, April 22d, 1837.

GENTLEMEN—Being a reader of your very useful Journal, I have observed that much has been said respecting the performance of the Locomotives of Mr. Norris, and their superiority in ascending inclined planes. I do not doubt the statements of Mr. Norris as regards the power of his Engines, and presume that his experiments have been correctly made; but they were all made when the road was dry and in the best possible condition: if the rails had been wet the result would have been much less, owing to the decrease of the adhesion in wet weather.

The communications which have been published in the Journal, between Mr. Norris and Mr. A. G. Steere, of N. Y. and Erie Railroad, have probably been caused by the miscalculation of the gravity of loads upon inclined planes, by Mr. Steere; he using the rule given by Pambour, the fallacy of which is very apparent, at least it appears not to give the result we wish to find, as it would give all the gravity on an angle of 45°; which is impossible; a weight suspended with all its gravity will hold or retain at a state of rest one of twice as heavy on an angle of 45°.

I admit that the rule given is perfectly applicable, as it respects the velocities of falling bodies upon inclinations; but what is necessary in the case under consideration, is, to find what weight suspended with all its gravity, or what amount of power applied to the crank of the Locomotive, will hold or retain at a state of rest; any given load, on any given inclination; then if a sufficient quantity of weight or power be applied to overcome the friction; the load will commence moving up the the plane.

I will submit the following table to those interested in the subject, and one of great importance in the construction of railways.

I have not been very precise in my calculations and experiments in forming the above table, but it will be found to vary much from the result of the rule used by Mr. Steere, in his calculations; by the above table, the gravity of a ton (2240) on an angle of 4°, would be 100 lbs.; but by rules given, it would be 156.8, as an angle of 4° is 7 feet rise in the 100 or 369 per mile. I will leave this subject to be settled by those more interested and better qualified for the task than myself.

	Level.	5¼th per mile. 1/1000	7 ft. per mile. 1/754	12 " 1/440	16 " 1/330	21 " 1/250	50 " 1/106	66 " 1/80	106 " 1/50	360 " 1/15	1056 " 1/5	5280 " 1/1
Angles of inclination	0	m. 3.5	m. 4.6	m. s. 7.8	m. 10.3	m. 14	m. s. 33.3	m. 43.8	dg.m. 1.12	dg.m. 3.40	dg.m 11.30	dg. 45
Gravity of a ton in lbs.	tcn. 0	lbs. 1.6	lbs. 2	lbs. 3.3	" 4.4	" 5.7	13.8	" 17.8	" 30	" 92	" 286	" 1120

Very respectfully,

Your ob't serv't,

E. F. ALDRICH.

TABLE V. CONTINUED.—THE EAGLE.

207	EAGLE.	52 00	*b*	27½	8·18	361·0	12 00	Two Horses.	7 passengers,& 2t 13cwt.= *c. q. lb.* 62 2 1	none	watr 14¼ from mrk.	watr 14¼ from mrk.	do.	dur run bow elev. 37′	Towing-line 8 ft. 9 in. from bow.
		52 27½	*c*	27	8·33	363·8	12·22								
		52 54½	*d*	26½	8·49	406·3	12·45								
		53 21	*e*	27	8 33	399 5	12 22								
		53 58	*f*												

TABLE VI.—THE HAWK.—(34 *Experiments.*)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the stake interval.	Miles per Hour.	Tractive power in lbs.	Feet per Second.	Tractive power.	Load.	Wind.	Draught. Bow	Draught. St'rn	Position of Wave.	Variation in Level.	Remarks. PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
		m. s.		sec.	miles.	lbs.	feet.								Weight of HAWK, 3 ton, 16 cwt. 0 q. 24 lb. Marks 18½ in. above the water were made at bow and stern, when the boat was empty.
		59 59′	*b*	19½	11·54	422·7	16·92				watr	watr.		dur.	
		18	*c*	18	12·50	417·4	18·33	Two	7 passengers, =		in.	in.	not	run.	
228	HAWK.	36	*d*	19	11·84	397·1	17·37	Horses.	*c. q. lb.*	none	16⅛	18⅜	obs.	bow	
		55	*e*	20½	10·97	373·7	16·09		9 2 1		from	from		elev.	
		1 15½	*f*								mrk	mrk.		8′	
		17 34	*b*	22½	10·00	347·9	14·67							do.	
		17 56½	*c*	23	9·78	320·5	14·35							do.	
209	HAWK.	18 19½	*d*	22½	10·00	309·0	14·67	do.	do.	do.	do.	do.	do.	elev.	
		18 42	*e*	23½	9·57	297·2	14·04							14′	
		27 04½	*b*	35½	6·34	147·3	9·30							do.	
		27 39	*c*	34½	6·52	127·7	9·57							do.	
210	HAWK.	28 13½	*d*	35½	6·34	139·0	9·30	do.	do.	do.	do.	do.	do.	elev.	
		28 48	*e*	34½	6·52	133·0	9·57							1′	
		29 22½	*f*												
		48 14	*b*	18½	12·16	431·0	17·84		7 passengers, and 7 cwt. = *c. q. lb.* 16 2 1	do.	17⅞ from mrk.	17 from mrk.	do.	do.	7cwt. made the Hawk and 7 passengers nearly equal to the LARK with 1 ton and 7 passengers.
		48 32½	*c*	19½	11·54	408·0	16·92							do.	
211	HAWK.	48 52	*d*	20	11 25	388·2	16·50	do.						elev.	
		49 12	*e*	20	11·25	376·6	16·50							18′	
		49 32	*f*												
		58 32½	*b*	23½	9·57	340·6	14·04							do.	
		52 56	*c*	23½	9·57	323·5	14·04							do.	
212	HAWK.	59 19½	*d*	23	9·78	302·0	14·35	do.	do.	do.	do.	do.	do.	elev.	
		59 42	*e*	23½	9·57	302·0	14·04							20′	
		05½	*f*												
		29 23½	*b*	20½	10·97	318·3	16·09		7 passengers, .and 4¼ ton, = *c. q. lb* 94 2 1					do.	
		29 44	*c*	20½	10·97	188·1	16·09				12¾	12¾		do.	
213	HAWK.	30 04½	*d*	21	10·71	148·7	15·71	do.		do.	from	from	do.	e'ev.	
		30 25½	*e*	21	10·47	423·6	15·35				mrk.	mrk.		16′	
		30 47	*f*												
		40 25½	*b*	26	8·65	127·0	12·69						15 ft.	do.	
		40 51½	*c*	27	8·33	395·4	12·22						from	do.	
214	HAWK.	41 18½	*d*	27	8·33	130·6	12·22	do.	do.	do.	do.	do.	the	elev.	
		41 45½	*c*	27½	8·18	448·2	12·00						bow.	31′	
		42 13	*f*												
		51 16½	*b*	49	4·58	75·38	6 67							do.	
		52 06	*c*	47½	4·76	57·31	6·98						not	do.	
215	HAWK.	53 53	*d*	50	4·50	64·30	6·60	do.	do.	do.	do.	do.	obs.	do.	
		54 43½	*e*	52½	4 29	54·80	6·29							level.	
		55 36	*f*												
		12 06	*b*	25	9·00	127·6	13·20							do.	
		12 31	*c*	27	8·33	108·6	12·22				11	14		do.	
216	HAWK.	12 58	*d*	28	8·03	121·2	11·79	do.	do.	fav.	from	from	do.	elev.	
		13 26	*e*	27	8·33	145·1	12·22			light	mrk.	mrk.		35′	
		13 53	*f*												

TABLE VI. CONTINUED.—THE HAWK.

217	Hawk.	24 3½ 24 57 25 23½ 25 51 26 20½	*b* *c* *d* *e* *f*	25½ 26½ 27½ 29½	8·82 8·49 8.18 7·59	412·0 401·0 425·6 417·5	12·94 12·45 12·00 11·19	Two Horses.	7 passengers, and 4¼ ton, = *c. q. lb.* 94 2 1	fav. light.	watr. in. 14 from mrk.	watr. in. 11 from mrk.	not obs.	dur. run. bow elev. 49′	Weight shifted aft.
218	Hawk.	17 23 17 45 18 06 18 27½ 18 49	*b* *c* *d* *e* *f*	22 21 21½ 21½	10·23 10.71 10·47 10·47	471·2 451·4 435·7 404·7	15·00 15·71 15·35 15·35	do.	7 passengers, & 3t. 17 cwt. = *c. q. lb.* 86 2 1	do.	13 from mrk.	13 from mrk.	do.	do. do. elev. 20′	3 ton 17 cwt. made the Hawk and 7 passengers nearly equal to the Rapid with 4¼ ton and 7 passengers.
219	Hawk.	58 44 59 10 59 37 03 30	*b* *c* *d* *e* *f*	26 27 26 26½	8·65 8·33 8·65 8·49	409·8 392·4 420·0 447·3	12·69 12·22 12·69 12·45	do.	do.	do.	do.	do.	do.	do. do. elev. 29′	3 ton 12 cwt. made the Hawk and 7 passengers nearly equal to the Lark with 4¼ ton and 7 passengers.
220	Hawk.	34 50 35 10½ 35 31 35 52½ 36 14	*b* *c* *d* *e* *f*	20½ 20½ 21½ 21½	10·97 10·97 10·47 10·47	510·7 453·2 415·0 407·2	16·09 16·09 15·35 15·35	do.	7 passengers, & 3t. 12 cwt. = *c. q. lb.* 81 2 1	do.	13¼ from mrk.	13¼ from mrk.	do.	do. do. elev. 12′	
221	Hawk.	48 45 49 11 49 37 50 03 50 31	*b* *c* *d* *e* *f*	26 26 26 28	8·65 8·65 8·65 8·03	411·3 404·3 408·3 414·0	12·69 12·69 12·69 11·79	do.	do.	do.	do.	do.	do.	do. do. elev. 37′	
222	Hawk.	14 29½ 14 50 15 11 15 32 15 55	*b* *c* *d* *e* *f*	21½ 21 21½ 22½	10·47 10·71 10·47 10·00	465·0 420·5 397·6 369·0	15·35 15·71 15·35 14·67	do.	7 passengers, and 3 ton, = *c. q. lb.* 69 2 1	do.	14 from mrk	14 from mrk.	do.	do. do. elev. 15′	
223	Hawk.	25 19 25 43 26 08 26 33½ 27 00	*b* *c* *d* *e* *f*	26 25 25½ 26	8·65 9·00 8·82 8·49	402·0 380·6 388·0 380·1	12·69 13·20 12·94 12·45	do.	do.	do.	do.	do.	do.	do. do. elev. 31′	
224	Hawk.	42 15½ 42 59½ 43 48 44 38 45 26½	*b* *c* *d* *e* *f*	44 48½ 50 48½	5·11 4·64 4·50 4·64	89 7 69·0 67·1 80·0	7·50 6·80 6 60 6·80	do.	do.	do.	do.	do.	do.	do. do. dep. 2′	
225	Hawk.	18 16½ 18 36 18 57 19 19½ 19 41	*b* *c* *d* *e* *f*	20½ 21 22½ 21½	10·97 10·71 10.00 10·47	427·0 402 2 390·6	16 09 15·71 14·67 15·35	do.	7 passengers, & 2t 12 cwt. = *c. q. lb.* 61 2 1	do.	14½ from mrk.	14½ from mrk.	do.	do. do. elev. 15′	2 ton 12 cwt. made the Hawk and 7 passengers nearly equal to the Rapid with 3 ton and 7 passengers.
226	Hawk.	28 58 29 23 29 49 30 14½ 30 40½	*b* *c* *d* *e* *f*	25 26 25½ 26	9·00 8·65 8·82 8·65	405·5 384·7 386·0 390·6	13·20 12·69 12 94 12·69	Two Horses.	7 passengers & 2t. 12cwt. = *c. q. lb.* 61 2 1	fav. light	watr in. 14½ from mrk.	watr. in. 14½ from mrk	not. obs.	dur. run. bow elev. 30′	
227	Hawk.	42 11½ 42 32½ 42 54½ 43 16 43 37	*b* *c* *d* *e* *f*	21 22 21½ 21	10·71 10·23 10·47 10·71	457·7 406·1 412·5 489·2	15.71 15·00 15·35 15·71	do.	do.	do.	do.	do.	do.	do. do. elev. 12′	
228	Hawk.	1 23 1 45 2 06 2 27½ 3 18½	*b* *c* *d* *e* *f*	22 21 21½ 21	10·23 10·71 10·47 10·71	461·6 397·5 403·3 390·3	15·00 15·71 15.35 15·71	do.	7 passengers & 2t. 7 cwt. = *c. q. lb.* 56 2 1	fav.	14¾ from mrk.	14¾ from mrk.	do.	do. do. elev. 13′	2 ton 7 cwt. made the Hawk and 7 passengers nearly equal to the Lark, with 3 ton and 7 passengers.

TABLE VI. CONTINUED.—THE HAWK.

229	Hawk.	19 30½	*b*	25½	8·82	401·8	12·94	do.	do.	do.	do.	do.	do.	do. elev. 31′	
		19 55	*c*	25	9·00	380·7	13·20								
		20 20	*d*	25	9·00	387·1	13·20								
		20 45	*e*	25½	8·82	384·5	12·94								
		20 10½	*f*												
230	Hawk.	47 32	*b*	21	10·71	454·4	15·71	do.	7 passengers and 2 tons, = *c. q. lb.* 49 2 1	do.	15 from mrk.	15 from mrk.	do.	do. do. elev. 14′	
		47 53	*c*	21	10·71	407·2	15·71								
		48 14	*d*	21	10·71	382·5	15·71								
		48 35	*e*	22	10·23	372·6	15·00								
		48 57	*f*												
231	Hawk.	51 42½	*b*	25½	8·82	393·0	12·94	do.	do.	do.	do.	do.	do.	do. do. elev. 34′	
		52 08	*c*	25	9.00	358·8	13·20								
		52 33	*d*	26	8·65	367·4	12·69								
		52 59	*e*	25	9·00	379·7	13·20								
		53 24	*f*												
232	Hawk.	5 57½	*b*	48½	4·64	74·6	6·80	do.	do.	do.	do.	do.	do.	do. do. level	
		6 46	*c*	52½	4·29	66·0	6·29								
		7 38½	*d*	52½	4·29	60·7	6·29								
		8 31	*e*	50½	4·46	58·1	6·53								
		9 21½	*f*												
233	Hawk.	23 19½	*b*	25½	8·82	397·9	12·94	do.	do.	do.	13¼ from mrk.	16⅜ from mrk.	do.	at rest dep. dur. run. elev. 29′	Weight shifted forward.
		23 44	*c*	24½	9·18	373·3	13·47								
		24 08½	*d*	23½	9·57	382·3	14·04								
		24 30	*e*	24	9·38	369·4	13·75								
		24 56	*f*												
234	Hawk.	50 48	*b*	24	9·38	367·8	13·75	do.	do.	fav. light.	16½ from mrk.	13½ from mrk.	do.	do. do. elev. 42′	Weight shifted aft.
		51 12	*c*	26	8·65	359·1	12·69								
		51 38	*d*	24½	9.18	390·9	13·47								
		52 02½	*e*	23½	9·57	395·7	14·04								
		52 26	*f*												
235	Hawk.	49 57	*b*	24	9·38	400	13·75	Two Horses.	7 passengers, and 2 ton, = *c. q. lb.* 49 2 1	fav. very light	watr. in. 1⅛ from mrk.	watr. in. 12⅝ from mrk.	not obs.	bow elev. at rest 30′ during run. 57′	Weights shifted.
		50 21	*c*	25	9·00	374.5	13·20								
		50 46	*d*	23½	9·57	383	14·04								
		51 09½	*e*	23	9·78	390	14·35								
		51 32½	*f*												
236	Hawk.	28 24	*b*	20	11·25	446·6	16·50	do.	7 passsengers, and 1t. 12cwt. =*c. q. lb.* 41 2 1	do.	15⅜ from mrk.	15⅜ from mrk.	do.	do. do. elev. 15′	Hawk, with 7 passengers, 1 ton, 12cwt. nearly equal to Rapid, with 2 ton and 7 passengers.
		28 44	*c*	19	11·84	396·2	17·37								
		29 05	*d*	21	10·71	386·3	15·71								
		29 26	*e*	21	10.71	374·5	15·71								
		29 47	*f*												
237	Hawk.	41 04	*b*	24½	9·18	379·3	13·47	do.	do.	do.	do.	do.	do.	do. do. elev. 25′	do.
		41 28	*c*	24¼	9·18	362·5	13·47								
		41 53	*d*	23½	9·57	374·3	14·04								
		42 16½	*e*	22½	10·00	360·4	14·67								
		42 40	*f*												
238	Hawk.	54 42½	*b*	20½	10·97	456·6	16·09	do.	7 passengers, & 1t 5cwt. = *c. q. lb.* 34 2 1	do.	15¾ from mrk.	15⅜ from mrk.	do.	do. do. elev. 14′	Hawk, with 7 passengers and 1 ton, 5cwt. nearly equal to Lark, with 1 ton, 18cwt. 7 passengers, and to Zephyr, with 3 ton, 7 passengers.
		55 03	*c*	20	11·25	406·2	16·50								
		55 23	*d*	21	10·71	380	15·71								
		55 44	*e*	22	10·23	372·6	15·00								
		56 06	*f*												
239	Hawk.	4 38	*b*	24½	9.18	369·4	13·47	do.	do.	do.	do.	do.	do.	do. do. elev. 34′	
		5 02½	*c*	25	9.00	348·5	13·20								
		5 27½	*d*	24	9.38	356·6	13·75								
		5 51½	*e*	24	9.38	357·5	13·75								
		6 15½	*f*												
240	Hawk.	21 50½	*b*	19½	11·54	450·6	16·92	do.	7 passengers, and 12cwt. = *c. q. lb.* 21 2 1	do.	11¾ from mrk.	11¾ from mrk.	do.	do. do. elev. 6′	Hawk, with 7 passengers and 12cwt. nearly equal to the Rapid, with 1 ton and 7 passengers.
		22 10	*c*	20½	10·97	381·7	16·09								
		22 30½	*d*	20	11·25	375·2	16·50								
		22 50½	*e*	22½	10·00	363·3	14·67								
		23 12½	*f*												

TABLE VI. CONTINUED.—THE HAWK.

241	HAWK.	31 40½	*b*	23½	9.57	366.1	14.04	do.	do.	do.	do.	do.	do.	dur. run. bow elev. 12′	
		32 04	*c*	23	9.98	343.9	14.35								
		32 26	*d*	23	9.98	341 3	14.35								
		33 50	*e*	24	9·38	318.5	13.75								
		34 14	*f*												

TABLE VII.—THE RAPID (SECOND SET—43 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught. Bow	Draught. St'rn	Position of Wave.	Variation in Level.	REMARKS. PLACE OF EXPERIMENT, FORTH AND CLYDE CANAL.
		min. sec.		sec.	miles	lbs.	feet.								
242	RAPID.	41 20	*b*					Two Horses.	7 passengers, and 4¼ ton, = *c. q. lb.* 94 2 1	unf. strng	in. 16	in. 16	not obs.	dur. run. bow elev. 17′	RAPID weighed when empty, 3 ton, 8cwt. 2qr. 20lb.
		41 51½	*c*	31½	7·14	338·7	10.48								
		42 23	*d*	31½	7·14	322·1	10·48								
		42 55	*e*	32	7·03	328·1	10·31								
		43 28	*f*	33	6·82	273·7	10·00								
243	RAPID.	53 19	*b*					do.	do.	do.	do.	do.	do.	do. do. elev. 40′	A Passage-boat passed at 5 sec.
		53 45	*c*	26	8·65	496·4	12·69								
		54 13	*d*	28	8·03	483·5	11·79								
		54 43	*e*	30	7·50	492	11·00								
		55 15	*f*	32	7·03	412·7	10.31								
244	RAPID.	5 54	*b*					do.	do.	do.	do.	do.	do.	do. do. elev. 48′	
		6 20	*c*	26	8·65	499·5	12·69								
		6 48	*d*	28	8·03	477·8	11·79								
		7 17½	*e*	29½	7·59	477·5	11·19								
		7 47	*f*	29½	7·57	473·5	11·19								
245	RAPID.	37 51	*b*					do.	7 passengers, and 4 ton = *c. q. lb.* 89 2 1	do.	16	do.	do.	do. do. elev. 40′	RAPID, with 7 passengers 4 ton, nearly equal to the LARK, with 4¼ ton and 7 passengers.
		38 18	*c*	27	8·33	483.8	12·22								
		38 46	*d*	28	8·03	477·5	11·79								
		39 15½	*e*	29½	7.59	547·8	11·19								
		39 45	*f*	29½	7.59	477·2	11·19								
246	RAPID.	35 13½	*b*					do.	do.	do.	do.	do.	do.	do. do. elev. 25	
		35 47	*c*	33½	6·72	488·8	9·85								
		36 09	*d*	32	7·03	470	10·31								
		36 40	*e*	31	7·26	466	10·65								
		37 11	*f*	31	7·26	428	10·65								
247	RAPID.	11 51	*b*					do.	do.	fav.	do.	do.	do.	do. do. elev. 1° 6′	
		12 16½	*c*	25½	8·82	456	12·94								
		12 42½	*d*	26	8·65	442.8	12·69								
		13 10	*e*	27½	8·18	455	12·00								
		13 38	*f*	28	8·03	467·2	11·79								
248	RAPID.	49 32½	*b*	24	9·38	447·1	13·75	do.	do.	do.	15⅛	15⅛	do.	do. do. elev. 50′	RAPID, with 7 passengers 3 ton, and 7cwt. nearly equal to the VELOCITY, HAWK, and EAGLE, with 3 ton and 7 passengers.
		49 56½	*c*	25	9·00	447·5	13·20								
		50 21½	*d*	24	9·38	429·6	13·75								
		50 45½	*e*	25	9·00	360·6	13·20								
		51 10½	*f*												
249	RAPID.	4 07	*b*	27½	8·18	419·3	12·00	do.	do.	light	do.	do.	do.	do. do. elev. 55′	
		4 34½	*c*	27½	8·18	411·4	12·00								
		5 02	*d*	27	8·33	452·8	12·22								
		5 29	*e*	28	8·03	453	11·79								
		5 57	*f*												
250	RAPID.	21 58	*b*	24	9·38	480·5	13·75	do.	7 passengers, & 2t 15cwt. = *c. q. lb* 64 2 1	do.	14⅛	14⅛	do.	do. do. elev. 10′	RAPID, with 7 passengers and 2 ton 15cwt. nearly equal to the LARK, with 3 ton and 7 passengers.
		22 22	*c*	22½	10·00	436.4	14·67								
		22 44½	*d*	23	9·78	413.5	14·35								
		23 07½	*e*	23½	9·57	370	14·04								
		23 31	*f*												

TABLE VII. CONTINUED.—THE RAPID (SECOND SET.)

251	RAPID.	33 14½	*b*	26½	8·49	406·8	2·48	Two Horses.	7 passengers, & 2t. 15 cwt. = *c. q. lb.* 64 2 1	fav. light	14⅛	in. 14⅛	not obs.	dur. run. bow elev. 35′	
		33 41	*c*	27½	8·18	390	12·00								
		34 08½	*d*	27½	8·18	400	12·00								
		34 36	*e*	28½	7·90	417·5	11·58								
		35 04½	*f*												
252	RAPID.	57 41	*b*	23	9·78	450	14·35	do.	7 passengers, & 2t 17 cwt. = *c. q. lb.* 56 2 1	none	13⅝	13⅝	do.	do. do. elev. 38′	RAPID, with 7 passengers & 2t. 7cwt. nearly equal to the EAGLE, VELOCITY, and HAWK, with 2t. and 7 passengers each.
		58 04	*c*	22	10·23	420	15·00								
		58 26	*d*	21½	10·47	419	15·35								
		58 47½	*e*	22	10·23	406	15·00								
		59 09½	*f*												
253	RAPID.	6 58	*b*	25½	8.82	401	12·94	do.	do.	do.	do.	do.	do.	do. do. elev. 48′	
		7 23½	*c*	26½	8·49	372	12·45								
		7 50	*d*	25½	8·82	407	12·94								
		8 15½	*e*	26½	8·49	397	12.45								
		8 45	*f*												
254	RAPID.	21 07½	*b*	23	10·23	440	15·00	do.	7 passengers, & 1t 15cwt. = *c. q. lb.* 44 2 1	do.	12¾	12⅝	do.	do. do. elev. 8′	RAPID, with 7 passengers, 1t 15cwt. nearly equal to the LARK, with 2t. and 7 passengers, and ZEPHYR, with 3t. and 7 passengers.
		21 29½	*c*	23	10·23	400	15·00								
		21 41½	*d*	21½	10·47	400	15·35								
		22 13	*e*	23	10·23	382·5	15·00								
		22 35	*f*												
255	RAPID.	30 46	*b*	26	8·65	360	12·69	do.	do	do.	do.	do.	do.	do. do. elev. 35′	
		31 12	*c*	26½	8·49	361·6	12·45								
		31 38½	*d*	27	8·33	352·2	12·22								
		32 05½	*e*	27	8·33	358·8	12·22								
		32 32½	*f*												
256	RAPID.	24	*b*	21	10·71	461	15·71	do.	7 passengers, & 1t 7cwt = *c. q. lb.* 36 2 1	do.	12	11¾	do.	do. do. elev. 18′	RAPID, with 7 passengers, and 1t. 7cwt. nearly equal to the VELOCITY, EAGLE, and HAWK, with 1t. and 7 passengers each.
		45	*c*	21	10·71	412·8	15·71								
		1 06	*d*	22	10·23	376	15·00								
		1 28	*e*	22½	10·00	352	14·67								
		1 50½	*f*												
257	RAPID	18 06	*b*	29	7·76	289	11·38	do.	do.	do.	do.	do.	do.	do. do. elev. 42	
		18 35	*c*	27	8·33	308	12·22								
		19 02	*d*	26	8·65	346	12·69								
		19 28	*e*	29	7·76	323·7	11·38								
		19 57	*f*												
258	RAPID.	26 05½	*b*	21½	10·47	374	15·35	do.	7 passengers, and 15cwt. = *c. q. lb.* 24 2 1	do.	do.	do.	do.	not obs.	RAPID, with 7 passengers and 15cwt. nearly equal to the LARK, with 1 ton and 7 passengers, and to the ZEPHYR, with 2 ton and 7 passengers.
		26 27	*c*	23	9·78	351	14·35								
		26 50	*d*	22	10·23	350	15·00								
		27 12	*e*	22	10·23	325	15·00								
		27 34	*f*												
259	RAPID.	35 35	*b*	29	7·76	302·8	11·38	do.	do.	do.	do.	do.	do.	not obs.	
		36 04	*c*	26	8·65	308·5	12·69								
		36 30	*d*	27	8·33	306·2	12·22								
		36 57	*e*	28	8·03	302·2	11·79								
		37 25	*f*												
260	RAPID.	11 42	*b*	32	7·03	320	10·31	Two Horses.	7 passengers, and 1 ton, = *c. q. lb.* 29 2 1	none	in. 11¼	in. 11¼	20 yards before the boat.	dur. run. bow elev. 1° 0′	
		12 14	*c*	35	6·43	326	9·43								
		12 49	*d*												
261	RAPID.	18 39	*b*	20	11·25	425	16·50	do.	do.	do.	do.	do.	just astern	do. do. elev. 10	
		18 59	*c*	21	10·71	387	15·71								
		19 20	*d*												
262	RAPID.	27 13	*b*	20½	10·97	391	16·09	do.	do.	do.	do.	do.	do.	do. do. elev. 10′	
		27 33½	*c*	20½	10·97	375	16·09								
		27 54	*d*												

TABLE VII. CONTINUED.—THE RAPID (SECOND SET.)

		33 34	*b*										about	do.		
263	RAPID.	33 59	*c*	25	9·00	366	13·20	do.	do.	do.	do.	do.	the middle of the boat.	do. lev. 6′		
		34 22	*d*	23	9·78	349	14·35									
		40 27	*b*										about 12ft. from the bow	do. elev. 9′		
264	RAPID.	41 04	*c*	37	6·08	172	8·92	do.	do.	do.	do.	do.		do.		
		41 40	*d*	36	6·25	164	9·17									
		49 53	*b*										about the bows, and a heavy wave after the boat	do. elev. 1° 1′		
265	RAPID.	50 25	*c*	32	7·03	324	10·31	do.	do.	do.	do.	do.		do.		
		50 59	*d*	34	6·62	345	9·71									
		59 17½	*b*											do.		
266	RAPID.	16	*c*	59	3·81	48	5·59	do	do.	do.	do.	do.		do.		
		1 19	*d*	62½	3·60	36	5·28							level		
		7 2	*b*											do.		
267	RAPID.	7 39	*c*	37	6·08	145	8·92	do.	do.	do.	do.	do.	about the quartr	do. elev. 15′		
		8 17	*d*	38	5·92	125	8.68									
		21 10½	*b*											do.		
268	RAPID.	21 31½	*c*	21½	10·71	406	15·71	do.	do.	do.	14½	9½	at the middle of the boat.	do. level	Shifted the weights to the bow.	
		21 53	*d*	21	10·47	342	15·35									
		28 28½	*b*						7 passengers, and 1 ton, =					dur. run.		
269	RAPID.	28 57	*c*	28½	7·90	364·7	11·58	Two		none	in.	in.	just at the bow.	bow elev. 25′	Heavy swell.	
		29 25	*d*	28	6·03	385	11·79	Horses.	*c.* *q.* *lb.* 29 2 1		14½	9½				
		36 59	*b*										15 feet farther aft.	do. elev. 15′		
270	RAPID.	37 24	*c*	25	9·00	318	13·20	do.	do.	do.	do.	do.		do.	Swell not so easy.	
		37 48	*d*	24	9·38	259	13·75									
		50 61½	*b*										about 20 yards before the boat.	do. elev. 54′		
271	RAPID.	51 22½	*c*	31	7·26	362·7	10·65	do.	do.	do.	do.	do.		do.		
		51 53	*d*	30½	7·38	431	10·82									
		58 38	*b*										a little before the boat.	do. elev. 43′		
272	RAPID.	59 11	*c*	33	6·82	313·5	10·00	do.	do.	do.	do.	do.		do.		
		59 44	*d*	33	6·82	346	10·00									
		6 54	*b*											do.		
273	RAPID.	7 42	*c*	48	4·69	82	6·88	do.	do.	do.	do.	do.	after the boat.	do. dep. 12′	Swell very slight.	
		8 30½	*d*	48½	4·64	78	6·80									
		14 3	*b*											do.		
274	RAPID.	14 24	*c*	21	10·71	395	15·71	do.	do.	do.	do.	do.	in mid-ships	do. dep. 5′		
		14 45	*d*	21	10·71	348	15·71									

TABLE VII. CONTINUED.—THE RAPID (SECOND SET).

275	RAPID.	23 20 23 44 24 7	*b* *c* *d*	24 23½	9·38 9·57	322 271	13·75 14·04	do.	do.	do.	do.	do.	about 18ft. from the bow.	do. do. elev. 22′	
276	RAPID.	45 20 45 48 46 14½	*b* *c* *d*	28 26½	8·03 8·49	373 389·6	11·79 12·45	do.	do.	do.	9	14	at the bow.	do. do. elev. 1°17′	Weight shifted to stern; swell very high, rose 3 feet.
277	RAPID.	54 10 54 30½ 54 51	*b* *c* *d*	20½ 20½	10·97 10·97	375 370·6	16·09 16·09	do.	do.	do.	do.	do.	at mid-ships	do. do. elev. 27′	Not so high.
278	RAPID.	3 53 4 26 4 59	*b* *c* *d*	33 33	6·82 6·82	324·6 350	10·00 10·00	Two Horses.	7 passengers, and 1 ton, = *c. q. lb.* 29 2 1	none	in. 9	in. 14	30 yrds before the boat, broken water behind the boat.	dur. run. bow elev. 1°18′	
279	RAPID.	12 58 13 52 14 43	*b* *c* *d*	54 51	4·17 4·41	60 58·7	6·11 6·47	do.	do.	do.	do.	do.		do. do. elev. 17′	Very little swell.
280	RAPID.	30½ 56 1 22	*b* *c* *d*	25½ 26	8·82 8·65	368 340·6	12·94 12·69	do.	do.	do.	do.	do.	at mid-ships	do. do. elev. 42′	
281	RAPID.	16 52 17 15½ 17 38	*b* *c* *d*	23½ 22½	9·57 10·00	383·5 328	14·04 14·67	do.	8 passengers, and 1 ton, = *c. q. lb.* 11 3 3	do.	not obs.	not. obs.		not. obs.	
282	RAPID.	31 55 32 15 32 35	*b* *c* *d*	20 20	11·25 11·25	366 347	16·50 16·50	do.	8 passengers, = *c. q. lb.* 10 3 3	do.	11	8¾		dur. run. bow level	
283	RAPID.	40 38 41 03½ 41 30	*b* *c* *d*	25½ 26½	8·82 8·49	319·7 366·5	12·94 12·45	do.	do.	do.	do.	do.		do. do. elev. 45′	
284	RAPID.	00 22½ 1 45	*b* *c* *d*	22½ 22½	10·00 10·00	301 278·6	14·67 14·67	do.	do.	do.	do.	do.		do. do. elev. 2′	Very little swell.
285	RAPID.	9 24½ 10 15 11 06¼	*b* *c* *d*	50½ 51½	4·46 4·37	61 67	6·53 6·41	do.	do.	do.	do.	do.			

TABLE VIII.—NEW BOAT (14 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's Name.	Instant of passing the Stake.	Stakes 110 yards apart.	Time of passing the Stake-interval.	Miles per Hour.	Tractive Power in lbs.	Feet per Second.	Kind of Tractive Power.	Load.	Wind.	Draught. Bow	Draught. St'rn	Position of Wave.	Variation in Level.	REMARKS. PLACE OF EXPERIMENT. FORTH AND CLYDE CANAL.
		m. s.		sec.	miles.	lbs.	feet.								Experiments on Keels of different forms.
		4 28	*b*						6 passengers, and 1 ton, =						
		4 53	*c*	25	9·00	206·5	13·20								
286	New Boat.	5 18	*d*	25	9·00	185	13·20	Two Horses.		none	not obs.	not obs.	not obs.	not obs.	Keel 30ft. long, 6in. deep, tapered off to a point at 4ft. from the ends. Boat 61ft. 6in. long.
		5 41	*e*	23	9·78	202·8	14·35		*c. q. lb.*						
		6 05	*f*	29	9·38	223·5	13·75		28 0 15						
		26 28½	*b*												
		26 47½	*c*	19	11·84	307	17·37								
287	New Boat.	27 06	*d*	18½	12·16	299	17·84	do.	do.	do.	do.	do.	do.	do.	Heavy rain.
		27 25	*e*	19	11·84	290·8	17·37								
		27 44	*f*	19	11·84	267·8	17·37								
		35 40	*b*												
		36 15	*c*	35	6·43	96·8	9·43								
288	New Boat.	36 51	*d*	36	6·25	86·6	9·17	do.	do.	unf. strng	do.	do.	do.	do.	
		37 27	*e*	36	6·25	84	9·17								
		38 03½	*f*	36½	6·16	81·7	9·04								
		48 32½	*b*												
		48 58	*c*	25½	8·82	193·8	12·94								
289	New Boat.	49 23½	*d*	25½	8·82	202·5	12·94								
		49 47½	*e*	24	9·38	190·7	13·75	do.	do.	do.	do.	do.	do.	do.	
		50 12½	*f*	25	9·00	186·6	13·20								
		46 25	*b*												
		46 54	*c*	29	7·76	164·5	11·38								
290	New Boat.	47 22½	*d*	28½	7·90	163	11·58								
		47 50	*e*	27½	8·18	178·8	12·00	do.	do.	do.	in. 24	in. 21⅛	do.	do.	Triangular Keel 20ft. long, 7in. deep.
		48 19½	*f*	28½	7·90	151·6	11·58								
		55 45	*b*												
		56 10	*c*	25	9·00	180·6	13·20								
291	New Boat.	56 33½	*d*	23½	9·57	203·7	14·04								
		57 57	*e*	23½	9·57	209	14·04	do.	do.	do.	do.	do.	do.	do.	
		58 21	*f*	24	9·38	191	13·75								
		2 38	*b*												
		2 54	*c*	16	14·06	339	20·63								
292	New Boat.	3 11	*d*	17	13·24	346·6	19·41								
		3 28½	*e*	17½	12·86	318	18·86	do.	do.	do.	do.	do.	do.	do.	
		3 46½	*f*	18	12·50	303	17·33								
		17 18½	*b*												
		17 37	*c*	18½	12·16	316·6	17·84								
293	New Boat.	17 57	*d*	20	11·25	288	16·50			not					
		18 17	*e*	20	11·25	273	16·50	do.	do.	so	do.	do.	do.	do.	Keel 20ft. long. 10in. deep in the middle, curved to both ends.
		18 37	*f*	20	11·25	277·5	16·50			strng					
		29 40	*b*												
		30 05	*c*	25	9·00	203·5	13·20								
294	New Boat.	30 29	*d*	24	9·38	192·8	13·75								
		30 54	*e*	25	9·00	192·5	13·23	do.	do.	do.	do.	do.	do.	do.	
		31 18	*f*	24	9·38	196·8	13·75								
		39 15½	*b*												
		40 05	*c*	52½	4·29	50	6·29		6 passengers, and 1 ton, =	unf.					
295	New Boat.	41 01	*d*	53	4·25	49	6·24	Two		not	in.	in.	not	not	Very little swell.
		41 55	*e*	54	4·17	47·7	6·11	Horses	*c. q. lb.*	so	24	21⅛	obs.	obs.	
		42 49	*f*	54	4·17	48	6·11		28 0 15	strng					

TABLE VIII. CONTINUED.—NEW BOAT.

		20 48	*b*	19	11·84	298	17·37								Keel 10 feet long, 14 in. deep in the middle, being the segment of a circle, the middle of which was 27 feet from the middle of boat forward.
		21 07	*c*	20	11·25	476	16·50								
296	New Boat.	21 27	*d*	19½	11·54	231	16·92	do.	do.	do.	23	21¾	do.	do.	
		21 46½	*e*	19½	11·54	267	16·92								
		22 06	*f*												
		27 33½	*b*	23½	9·57	207	14·04								
		27 57	*c*	24	9·38	214	13·75								
297	New Boat.	28 21	*d*	23	9·78	221	14·35	do.	do.	do.	do.	do.	do.	do.	
		28 44	*e*	23	9·78	200·7	14·35								
		29 07	*f*												
		37 11	*b*	40½	5·56	73	8·15								
		37 51½	*c*	36½	6·16	88	9·04								
298	New Boat.	38 28	*d*	38½	5·81	71·8	8·57	do.	do.	do.	do.	do.	do.	do.	
		39 06½	*e*	38½	5·84	78.5	8·57								
		39 45	*f*												

TABLE IX.—THE SWIFT (First Set—11 *Experiments*).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
No. of Experiment.	Boat's name.	Instant of passing the stake.	Stakes 110 yards apart.	Time of passing the stake-interval.	Miles per hour.	Tractive power in lbs.	Feet per second.	Kind of tractive power.	Load.	Wind.	Draught.		Position of Wave.	Variation in Level.	Remarks.
											Bow.	St'n			PLACE OF EXPERIMENT, GLASGOW AND PAISLEY CANAL
		m. s.		sec.	miles.	lbs.	feet.								
		21 25	*b*						7 passengers, and		in.	in.		dur.	
				24	9·38	233·3	13·75	Two	3 tons, =	light	13½	13¾		run.	
299	Swift.	21 49	*c*					Horses.	*c. q. lb.*					bow	
				24	9·38	230·6	13·75		69 2 1					elev.	
		22 13	*d*											4′	
		33 30½	*b*											do.	
				16	14·06	521·7	20·63						17 feet	do.	Boat one-third the width of the canal from the towing-path.
300	Swift.	33 46½	*c*					do.	do.	do.	do.	do.	from	do.	
				17½	12·86	475	18·86						stern on lar-	elev.	
		34 04	*d*										board side.	6′	
		39	*b*											do.	
				20	11·25	358	16·50						more	do.	
301	Swift.	59	*c*					do.	do.	do.	do.	do.	forward	do.	
				20	11·25	344	16·50						than last	elev.	
		1 19	*d*										experi-	8′	
		51 14½	*b*										ment.	do.	
				24½	9·18	250	13·47							do.	
302	Swift.	51 39	*c*					do.	do.	do.	do.	do.	at	do.	Horses did not go steady.
				24	9·38	221	13·75						mid-	elev.	
		52 03	*d*										ships	5′	
		4 40	*b*											do.	
				24	9·38	272	13·75							do.	
303	Swift.	5 04	*c*					do.	do.	do.	do.	do.		do.	
				26	8·65	222	12·69							dep.	
		5 30	*d*											5′	
		13 36	*b*											do.	
				25	9·00	268	13·20						about	do.	
304	Swift.	14 01	*c*					do.	do.	do.	do.	do.	1-4 from	do.	Not a good experiment.
				26½	8·49	161	12·45						bow.	elev.	
		14 27½	*d*											29′	
		21 47	*b*											do.	
				33	6·82	360	10·00							do.	
305	Swift.	22 20	*c*					do.	do.	do.	do.	do.	40 yards a head of boat.	do.	
				33	6·82	371	10·00							elev.	
		22 53	*d*											1° 7′	

III. IMPROVED CANAL LOCK, BY JOSHUA FIELD, SQ., F.R.S., V.P.INST.C.E.

The numerous and extensive navigable canals by which this kingdom is intersected have tended in a great degree to exhaust every natural source from which water for their supply can be obtained; this renders the further extension of these important channels of commerce difficult, and in many cases impracticable. Some canals are altogether supplied by artificial means at an enormous expense, others only in part, whilst the greater number, depending upon natural sources alone, are more or less in want of water, and consequently the navigation is interrupted during the driest season of the year.

To lessen the great want of water by the common canal locks has long been a standing desideratum amongst engineers, and perhaps no subject has engaged more talent and ingenuity than the solution of this hydrostatic problem. Numerous contrivances have been resorted to, some to save the whole and others part of the lockage water: many of these are beautiful in theory, and perfectly successful upon a small scale, but when they have been tried upon the full magnitude they have uniformly failed, chiefly from the circumstance of the scheme involving some prodigious moving plunger or caisson, floated or suspended; and in most cases this vessel has been required to be perfectly water or air tight, and poised with the utmost precision,—conditions hardly to be obtained in practice, and if attained, the expense alone would defeat the object.

When the rough usage to which canal locks are subject is considered, and the ignorance of the persons necessarily employed in the management of them, it does not seem probable that any conservative lock will succeed until the whole apparatus shall be reduced to fixed masonry, and no other machinery employed than common gates and paddles, or sluices; for of all that have been invented, and for which upwards of twenty patents have been granted, none have been brought into practice for any length of time, except those of the side-pond class which save half the water, and which, though less simple than the common lock, consist of the same parts, and are found completely manageable by the persons usually employed on canals. Having been engaged in the execution of the largest conservative lock that has been constructed, my mind has been long engaged in the pursuit of some more simple means of effecting the same object. for very little reasoning on the subject will be sufficient to show that every common lock full of water, let down from the upper to the lower level, possesses in itself a physical power or force sufficient to raise an equal quantity of water from the lower level to the height from which it has descended,—action and reaction, cause and effect, being equal.

The method by which I propose to render the descending lock of water available for raising an equal quantity is, in its simplest form, as follows: at a suitable distance from any common lock, in any direction I have a side pond or basin, of an area and depth equal to the lock and communicating with it by a large and long culvert, rather under the lower level; the diameter and length of this culvert must be such that it will contain as much water as the lock. each end of the culvert is to be provided with a sluice, shown in the diagram, Fig. 1, at A and B. (Plate VI.)

The lock being full or equal to the upper level, and the side pond empty, or equal to the lower level, the operation will be as follows:—when the sluice or valve at A is opened, the head of water in the lock will very gradually put the water contained in the culvert in motion, the velocity accelerating by the laws which govern the motion of fluids, until the levels of the water in the lock and side pond coincide; at this time the column of water in the culvert will have acquired a velocity due to the height fallen, it will then continue to move forward with a momentum that will not be destroyed, until the water has risen in the side pond to the height from which it descended in the lock, abating somewhat for the loss of effect from the friction of the water against the sides of the tunnel, &c., the water gradually coming to rest, when the sluice *B* in the side pond must be shut to retain it,—the converse operation is performed by opening the sluice *B*, when the lock will fill and the side pond become empty.

The principle of this lock may be well illustrated by the vibrations of a pendulum, which in like manner, actuated by the force of gravity, falls to the lowest point with an accelerating velocity, when it requires a momentum sufficient to raise it up the other side of the arc, nearly to the height from which it fell, the loss being only that arising from the friction of the suspending point and the resistance offered by the air.

It is from the close analogy it bears to the pendulum that I judge the culvert should contain as much weight of water as the lock that it may acquire sufficient momentum: it may contain more, but I think it should not contain less; thus the quantity of water raised will be equal to the quantity fallen, less the loss by friction in its transit;—the friction against the sides of a tube or culvert is simply as the diameter of the tube, while the area is as the square of the diameter, therefore the larger the tube the less in proportion will be the friction, hence the larger the lock the more complete will be the effect, and the operation of a model cannot be, like most other models of conservative locks, so perfect as a full-sized lock.

Although a lock upon this principle has not been executed upon the full scale, I have tried it in a model of sufficient magnitude to justify the greatest confidence of its perfect success.

The model consisted of two cisterns five feet long by twenty inches wide, having a communicating pipe of eight inches in diameter and forty-five feet long; a door valve, having a lever to open it, was fitted to each end of the pipe opening into the cisterns; a graduated scale was accurately placed in each cistern, and a ready means provided or adding to or taking from the water of either cistern as occasion might require—experiments were then made with various differences of levels, from twelve inches downwards, the results of which are here stated.

Difference of level 12 inches—the water rose in the opposite cistern		10½
8 inches	Do.	7⅞
6 "	Do.	5⅞
4 "	Do.	3 1/16

When tried at less differences it apparently rose to the same height, and when both the doors or valves were left open, it continued vibrating nearly an hour before it came quite to rest; and it is remarkable that the vibrations, whether twelve inches or one-eight of an inch, were performed in equal times, namely 10 seconds. This experiment was tried in 1816, and I have annexed a sketch of the apparatus used for the purpose. Fig. 2.

Having described the principle in its simplest form, and given the results of the experiments made with the model, I shall now point out several modifications that have occurred to me in applying it to the purpose proposed.

The column of communication in the model and so far as spoken of hitherto, is straight; but this would remove the side pond to an inconvenient distance from the lock, and occupy much ground. This objection is removed by the plan proposed in Fig. 3, wherein the column forms a volute round the side pond or basin, by which means very little ground is required, and the sluices or paddles at each extremity of the culvert are brought very near together.

Fig. 4 shows its application to a double lock;—here the culvert is carried in a large circle, under the bed of the upper level,—one lock forming the side pond for the other.

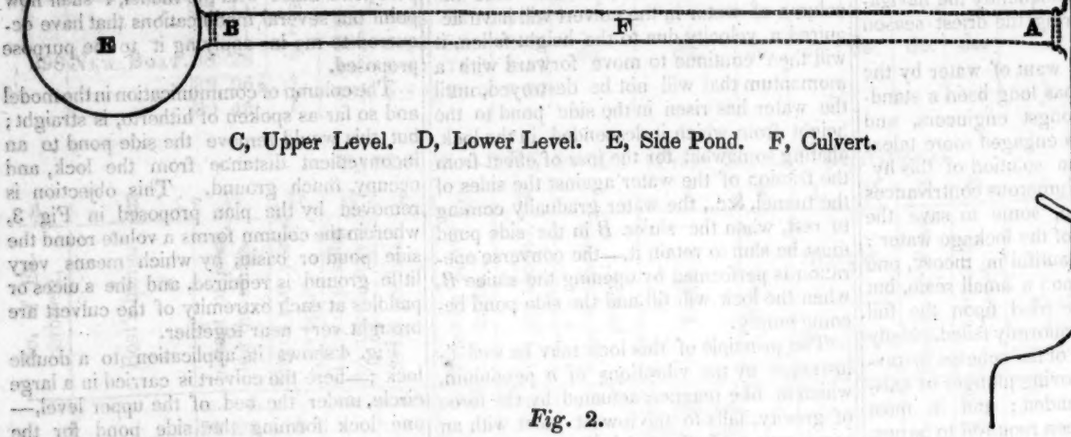
The next and last modification I shall notice is described in Fig. 5. The object here is to dispense with the side pond altogether. As this is not so obvious as the former methods, it may be necessary to refer to the letters in the sketch. Let *A* be a long culvert, leading from the lock up into the upper level, at *B*, having a sluice at each end, as before; there is a branch near *B* leading into *C*, which is an open cut from the lower level. Now when a lock full of water is to be discharged, the sluice at *D* is to be opened, the water will then run along *A*, and out at *C*, into the open cut; when half the water has run out, a swinging valve, situated at *E*, must be moved so as to shut the passage into *C*, and open it into the upper level *B*; the water having acquired its greatest momentum, will continue to run up into the upper level until the lock is empty, when *B* must be shut. The converse operation is thus performed:—open *B*, and the water will flow freely into the lock; when that is half full shut *B*, and the swinging valve *E* will open, and the column in motion will draw up water from the open cut, until the lock is full.—This modification, I admit, is open to many objections, and is one I should certainly not adopt;—the methods described in Figs. 3 and 4, are I conceive best adapted for practice.

The principle upon which this lock depends is the same as that of the hydraulic ram of Montgolfier, much used in France for raising water a considerable height, by a small fall. The experiments made by him, and those who have followed him, show that the loss by friction is not great, even in his pipes, which seldom exceed two inches in diameter; this, with the result of my experiments with much larger pipes, leads me to expect the loss in a culvert of four or five feet diameter will be very inconsiderable. A

Plate 6.

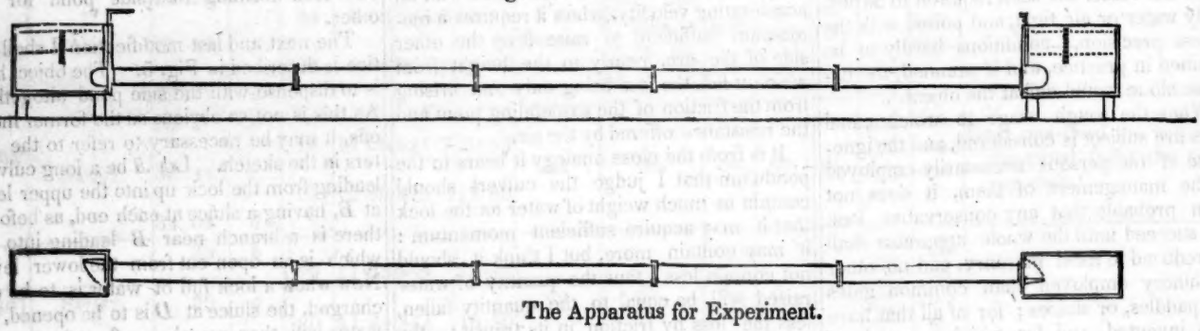
Fig. 1.

Side Pond with Straight Culvert.



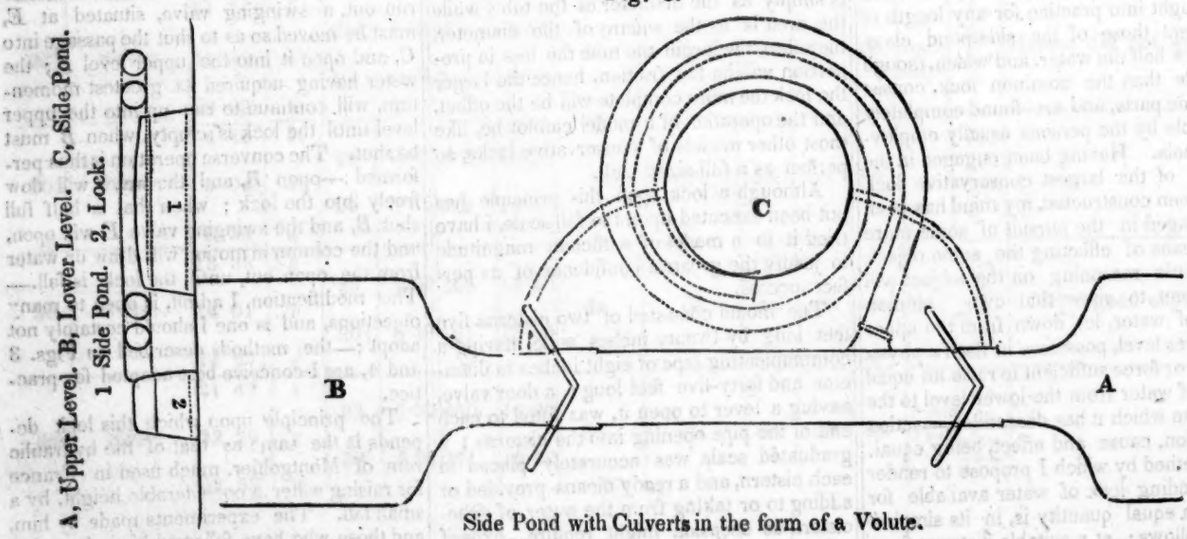
C, Upper Level. D, Lower Level. E, Side Pond. F, Culvert.

Fig. 2.



The Apparatus for Experiment.

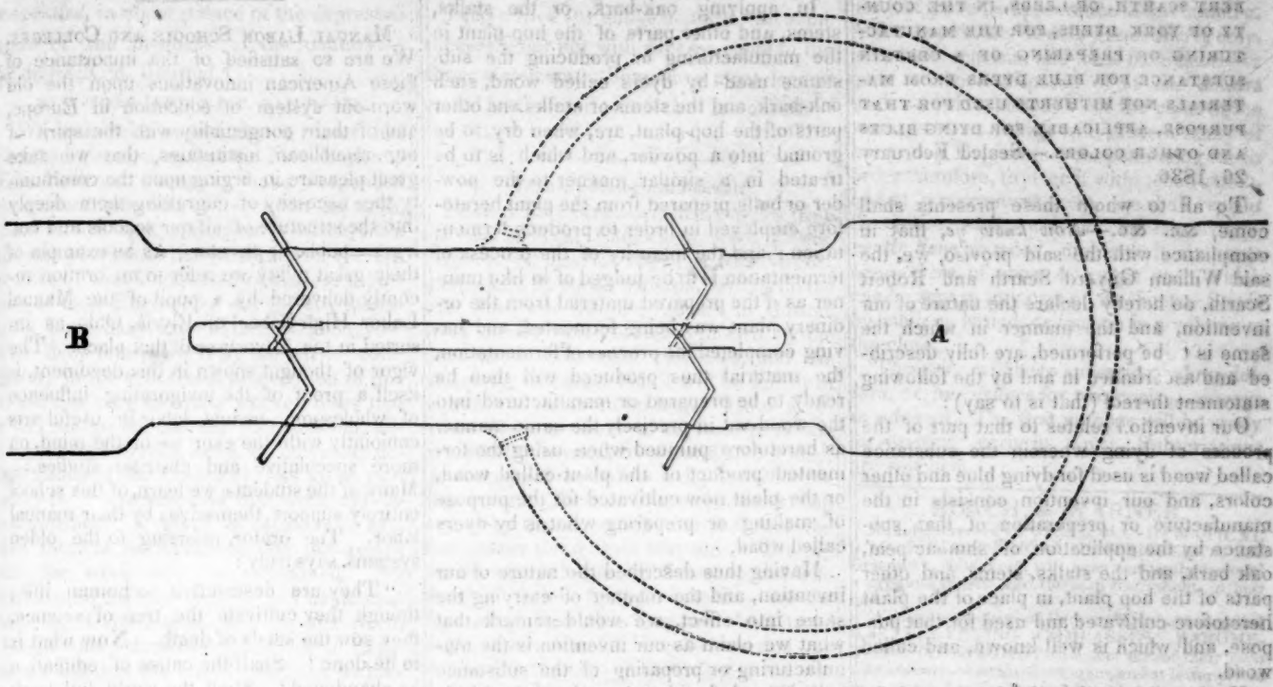
Fig. 3.



Side Pond with Culverts in the form of a Volute.

Fig. 4.

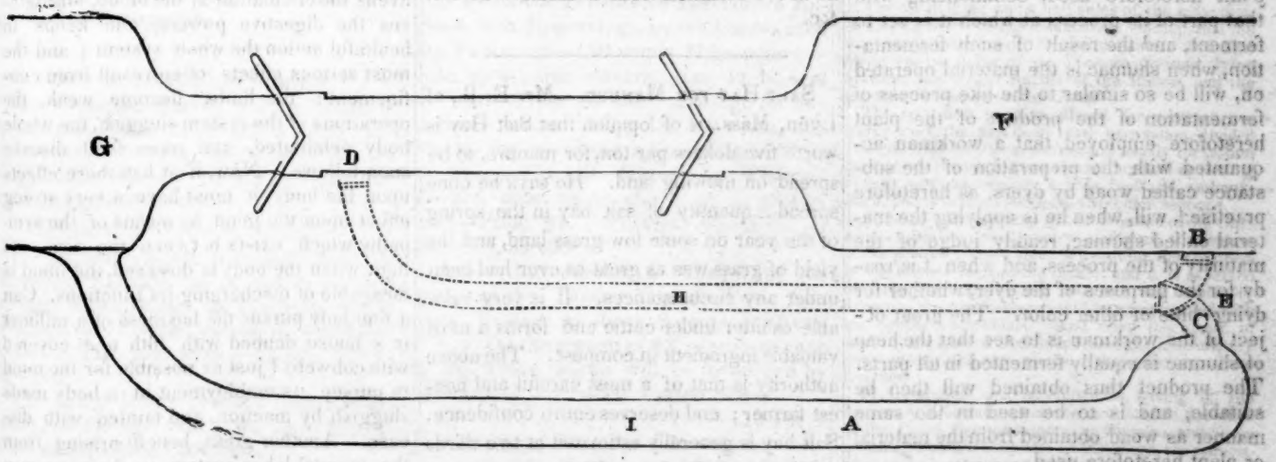
Double Locks with Circular Culvert under Upper Level.



A, Upper Level. B, Lower Level.

Fig. 5.

Without a Side Pond.



F, Upper Level. G, Lower Level. H, Long Culvert. I, Open Cut to the Lower Level.

calculation made also from the table given by Smeaton, of the head of water necessary to overcome the friction of pipes up to twelve inches' bore, at various altitudes, leads to the same result.

The time it would take to pass a barge, or to change the level of a lock upon this principle, would certainly not be longer than is required at present, and perhaps not so long.

I should imagine that a lock, well constructed upon this principle, having the culvert very smooth, would save nine-tenths of the water, and that the change would be effected in less than one minute. On an attentive consideration of this subject, several methods have occurred to me of making the large sluices, or paddles, so as to be quickly and easily opened and shut, and of various securities in the management of so large a column in motion, with some necessary compensations, &c., which would be obvious to any one about to adopt it.

I beg to present the foregoing remarks to the Institution of Civil Engineers, in the hope that the idea therein suggested being generally known may lead to the practical oppe. ration of the plan.

From the Repertory of Patent Inventions.

SPECIFICATION OF THE PATENT GRANTED TO WILLIAM GILYARD SCARTH AND ROBERT SCARTH, OF LEEDS, IN THE COUNTY OF YORK, DYERS, FOR THE MANUFACTURING OR PREPARING OF A CERTAIN SUBSTANCE FOR BLUE DYERS FROM MATERIALS NOT HITHERTO USED FOR THAT PURPOSE, APPLICABLE FOR DYING BLUES AND OTHER COLORS.—Sealed February 26, 1836.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, we, the said William Gilyard Scarth and Robert Scarth, do hereby declare the nature of our invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof (that is to say):

Our invention relates to that part of the process of dying wherein the substance called woad is used for dying blue and other colors, and our invention consists in the manufacture or preparation of that substance by the application of shumac peat, oak bark, and the stalks, stems, and other parts of the hop plant, in place of the plant heretofore cultivated and used for that purpose, and which is well known, and called woad.

Having thus explained the object of our invention, we will describe the manner of carrying the same into effect.

Take any quantity of the shumac of commerce, the same is to be springled with water and placed in a heap, in order to produce fermentation, in like manner to the course pursued with the preparation of the plant heretofore used, commencing with that part of its process at which it is set to ferment, and the result of such fermentation, when shumac is the material operated on, will be so similar to the like process of fermentation of the product of the plant heretofore employed, that a workman acquainted with the preparation of the substance called woad by dyers, as heretofore practised, will, when he is applying the material called shumac, readily judge of the maturity of the process, and when it is ready for the purposes of the dyer, whether for dying blue or other color. The great object of the workman is to see that the heap of shumac is equally fermented in all parts. The product thus obtained will then be suitable, and is to be used in the same manner as woad obtained from the material or plant heretofore used.

In using peat as a substitute for the product of the plant heretofore employed in the manufacture of the substance used by dyers called woad, peat will in some instances be found to be in such a condition as to be suitable at once to be used by the dyer, and this will readily be judged of by taking a sample and testing it; but should the peat not be found suitable for proceeding at once to the preparation of the woad vat, then the peat is to be pulverized, and submitted to the process of fermentation, by placing it in heaps and applying water, till it becomes of that state or condition to be suitable, and this will readily be judged of by a workman acquainted with the production of the substance as heretofore practised in obtaining it from the plant now in use.

In applying oak-bark, or the stalks, stems, and other parts of the hop-plant in the manufacturing or producing the substance used by dyers called woad, such oak-bark, and the stems or stalks and other parts of the hop-plant, are, when dry, to be ground into a powder, and which is to be treated in a similar manner to the powder or balls prepared from the plant heretofore employed in order to produce fermentation; and the maturity of the process of fermentation is to be judged of in like manner as if the prepared material from the ordinary plant was being fermented, and having completed the process of fermentation, the material thus produced will then be ready to be prepared or manufactured into the wood-vat in precisely the same manner as heretofore pursued when using the fermented product of the plant called woad, or the plant now cultivated for the purpose of making or preparing what is by dyers called woad.

Having thus described the nature of our invention, and the manner of carrying the same into effect, we would remark that what we claim as our invention is the manufacturing or preparing of the substance called woad for blue-dyers by the application of shumac, peat, oak-bark, and the stalks, stems, or other parts of the hop-plant, as a substitute for the plant called woad, that is, the plant now cultivated, which, being prepared by grinding and fermentation, is, when applied by dyers for dying blue and other colors, called woad, as above described.—In witness whereof, &c.

Salt Hay for Manure.—Mr. E. B., of Lynn, Mass., is of opinion that Salt Hay is worth five dollars per ton, for manure, to be spread on mowing land. He says he once spread a quantity of salt hay in the spring of the year on some low grass land, and the yield of grass was as great as ever had been under any circumstances. It is very valuable as litter under cattle and forms a most valuable ingredient in compost. The above authority is that of a most careful and honest farmer; and deserves entire confidence. Salt hay is generally estimated at two-thirds the value of English. There are several kinds of it; some of it too coarse for any purpose but that of litter. We speak of the finest quality; when well cured it is eaten with great avidity by the cattle, and is substantial and nutritious. It will not answer for milch cows, as it very soon diminishes the secretions of milk. Of course it cannot be often afforded to use it for manure. In cases of extraordinary abundance, however, or low price of English hay; or of damage to the salt hay in curing from the tide or rains, it may sometimes be profitably applied as manure. The fact of its successful application in this way is at least worth recording. H. C.

Manual Labor Schools and Colleges. We are so satisfied of the importance of these American innovations upon the old worn-out system of education in Europe, and of their congeniality with the spirit of our republican institutions, that we take great pleasure in urging upon the community the necessity of engrafting them deeply into the structure of all our schools and colleges—public or private. As an example of their great utility we refer to an oration recently delivered by a pupil of the Manual Labor High School of Elyria, Ohio, as inserted in the Advertiser of that place. The vigor of thought shown in this document, is itself a proof of the invigorating influence of wholesome manual labor in useful arts conjointly with the exercise of the mind, on more speculative and abstruse studies.—Many of the students, we learn, of this school entirely support themselves by their manual labor. The orator, referring to the olden systems, says truly:

"They are destructive to human life; though they cultivate the tree of science, they sow the seeds of death. Now what is to be done? Shall the cause of education be abandoned? Shall the world fall back into barbarism? Or shall science continue to be watered with human blood, and college bowers become the graves of the students?"

Again:

"Does manual labor have a good effect upon the body? Evidently it does; it enlivens the circulation of the blood, strengthens the digestive powers, and keeps in healthful action the whole system; and the most serious effects often result from confinement; the limbs become weak, the operations of the system sluggish, the whole body debilitated, and some fatal disease soon follows. Now, if it has these effects upon the body, it must have a very strong effect upon the mind, by means of the sympathy which exists between the two,—so that, when the body is diseased, the mind is incapable of discharging its functions. Can a fine lady pursue the business of a milliner in a house daubed with filth and covered with cobwebs? just as possible for the mind to pursue its employment in a body made sluggish by inaction and tainted with disease. Another great benefit arising from the manual labor system, is, the pecuniary aid it renders to the student; and, indeed, without this aid, the benefits of education would be denied to a great part of community."

[Our common schools afford abundant education gratuitously, but they do not give food and raiment.]

"Some oppose this system no doubt, for the very reason which makes the republican and the philanthropist love it; because it unlocks the temple of science, throws open the iron gates, and bids the indigent youth enter and eat of the banquet hitherto provided only for the rich."—[Sunday Morning News.]

We republish the following extract from the Dunkirk Beacon, of April 19th, with the single remark, that the work is only *suspended*, in consequence of the depressed state of the business of the country.—[Editors R. R. Journal.]

NEW-YORK AND ERIE RAILROAD.

We learn with regret, that a rumor has obtained circulation, that the New-York and Erie Railroad Company have suspended their operations, and will abandon the work. This rumor has undoubtedly arisen from the late prudential determination of the Directors of that Company, to dismiss a portion of their Engineers, and thereby diminish a large daily expenditure of money.—The deep interest felt by the whole community in the successful prosecution of this work, has very naturally excited fears that it will not go on, and the judicious act, under present circumstances, of curtailing the operations of the Company, has given currency to the report, that that work will be relinquished. It gives us pleasure to say, that there is no foundation for the report that the work will be abandoned. We understand that the surveys in Chautauque and the Cattaraugus, will be continued, though with a diminished number of Engineers, and that the line of road will be prepared for letting to contractors, whenever the present general pecuniary alarm shall have subsided. It is confidently believed, that the lapse of a few weeks will produce this desirable change in the condition of the country. This great work *cannot be abandoned*. The feelings—the interests, the necessities of the whole Southern section of the State, *City and County*, requie and will enforce its construction.

From the Poughkeepsie Telegraph.

Mr. Cornelius Husted, of Pine Plains, in this county, fattened this fall, a "lady pig" and eleven "blooming responsibilities," the weight of which was twenty-four hundred and thirty-seven pounds.

DUCTHESS OUTDONE BY TOMPKINS.

We are authorised to state, that Mr. C. H. Morrell, of Lansing, has fattened a sow and her litter of twelve pigs, the aggregate weight of which, in a dressed condition, was 3,550 pounds. The pigs were 9 months and 10 days old.

This is the largest product from a single family, of the age, which we have any account of.—[Ithaca Chronicle.]

CHEAP MANURE.—"Raise a platform of earth on the headland of a field, eight feet wide, one foot high, and of any length according to the quantity wanted. On the first stratum of earth lay a thin stratum of lime fresh from the kiln; dissolve or slake this with salt brine from the nose of a watering pot; add immediately another layer of earth, then lime and brine as before; carrying it to any convenient height. In a week it should be turned over, carefully broken, and mixed, so that the mass may be thoroughly incorporated. This compost has been used in Ireland; has doubled the crop of potatoes and cabbage; and is said to be far superior to stable dung."

I have tried the above manure with some success; but not with success equal to the above statement. Something must depend on the kind of soil to which it is applied.

H. C.

From the Springfield Journal.

BOSTON PIGGERY.—About six miles from the city, in West Cambridge, is the Boston Piggery. At least for 700 hogs are here constantly kept in pork condition, *entirely* on the offal from the dwelling houses in Boston, every one of which is visited in turn by the city carts. The offal increases, and the contractor calculates that it will be sufficient hereafter to fatten 1,000 hogs. He now receives four cart loads a day, and pays the city $3,500 a year, or about $2,75 a load. He receives three dollars a day for what the hogs leave. The city Treasury loses $1000 a year by the operation, and it is said the man makes three times that sum. The pig pen is an enclosure of fifteen acres, with places of shelter from the storm. As the hogs attain their size, they are slaughtered on the spot—the fat barrelled up, and the lean sold in the city. According to the rule in the country, the contractor should furnish each family in the city once a year with a spare-rib, for the food furnished the piggery.

TO CONTRACTORS.

JAMES RIVER AND KANAWHA CANAL.

THERE is still a large amount of mechanical work to let on the line of the James River and Kanawha Improvement, consisting of twenty locks, about one hundred culverts and several large aqueducts, which will be offered to responsible contractors at fair prices.

The locks and aqueducts are to be built of cut stone.

The work contracted for must be finished by the 1st day of July, 1838.

Persons desirous of obtaining work are requested to apply at the office of the undersigned, in the city of Richmond, before the fifteenth of May, or between the fifth and the fifteenth of July.

CHARLES ELLET, Jr.
Chief Engineer Jas. Riv. & Ka. Co.

P. S.—The valley of James River above Richmond is healthy.

16—10t

TO RAILROAD CONTRACTORS.

SEALED proposals will be received at the office of the Selma and Tennessee River Railroad Company, in the town of Selma, Alabama, for the graduation of the first forty miles of the Selma and Tennessee Railroad. Proposals for the first six miles from Selma, will be received after the first of May, and acted on by the Board on the 15th May. Proposals for the ensuing 34 miles, will be received after the 10th May, but will not be examined until the 1st of August next, when the work will be ready for contract.

The line, after the first few miles, pursuing the flat of the Mulberry Creek, occupies a region of country, having the repute of being highly healthful. It is free from ponds and swamps, and is well watered.—The soil is generally in cultivation, and is dry, light and sandy, and uncommonly easy of excavation.—The entire length of the line of the Selma and Tennessee Railroads, will be about 170 miles, passing generally through a region as favorable for health as any in the Southern Country.

Owing to the great interest at stake in the success of this enterprise, and the amount of capital already embarked in it, this work must necessarily proceed with vigor, and I invite the attention of men of industry and enterprise, both at the North and elsewhere to this undertaking, as offering in the prospect of continued employment, and the character of the soil and climate, a wide and desirable field to the contractor.

Proposals may be addressed either to the subscriber, or to General Gilbert Shearer, President of the Company.

ANDREW ALFRED DEXTER, Chief Engineer
Selma, Ala., March 20th, 1837. A 15 tf

RAILWAY IRON, LOCOMOTIVES, &c.

THE subscribers offer the following articles for sale.

Railway Iron, flat bars, with countersunk holes and mitred joints,

					lbs.
250 tons	2½	by	1,	15 ft in length, weighing	4 $\frac{68}{100}$ per ft.
280 "	2 "		1, "	" "	3 $\frac{50}{100}$ "
70 "	1¼ "		1, "	" "	2½ "
80 "	1¼ "		½, "	" "	1 $\frac{25}{100}$ "
90 "	1 "		½, "	" "	½ "

with Spikes and Splicing Plates adapted thereto. To be sold free of duty to State governments or incorporated companies.

Orders for Pennsylvania Boiler Iron executed.

Rail Road Car and Locomotive Engine Tires, wrought and turned or unturned, ready to be fitted on the wheels, viz. 30, 33, 36, 42, 44, 54, and 60 inches diameter.

E. V. Patent Chain Cable Bolts for Railway Car axles, in lengths of 12 feet 6 inches, to 13 feet 2¼, 2¾ 3, 3¼, 3½, 3¾, and 3¾ inches diameter.

Chains for Inclined Planes, short and stay links, manufactured from the E. V. Cable Bolts, and proved at the greatest strain.

India Rubber Rope for Inclined Planes, made from New Zealand flax.

Also Patent Hemp Cordage for Inclined Planes, and Canal Towing Lines.

Patent Felt for placing between the iron chair and stone block of Edge Railways.

Every description of Railway Iron, as well as Locomotive Engines, imported at the shortest notice, by the agency of one of our partners, who resides in England for this purpose.

A highly respectable American Engineer, resides in England for the purpose of inspecting all Locomotives, Machinery, Railway Iron &c. ordered through us.

A. & G. RALSTON & CO.,
28 tf Philadelphia, No. 4, South Front st.

AMES' CELEBRATED SHOVELS, SPADES, &c.

300 dozens Ames' superior back-strap Shovels
150 do do do plain do
150 do do do caststeel Shovels & Spades
150 do do Gold-mining Shovels
100 do do plated Spades
50 do do socket Shovels and Spades.

Together with Pick Axes, Churn Drills, and Crow Bars (steel pointed,) manufactured from Salisbury refined iron—for sale by the manufacturing agents,

WITHERELL, AMES & CO.
No. 2 Liberty street, New-York.
BACKUS, AMES & CO.
No. 8 State street, Albany

N. B—Also furnished to order, Shapes of every description, made from Salsbury refined Iron v4—tf

STEPHENSON,

Builder of a superior style of Passenger Cars for Railroads.

No. 264 Elizabeth street, near Bleecker street, New-York.

RAILROAD COMPANIES would do well to examine these Cars; a specimen of which may be seen on that part of the New-York and Harlaem Railroad now in operation J25tf

PATENT RAILROAD, SHIP AND BOAT SPIKES.

**The Troy Iron and Nail Factory keeps constantly for sale a very extensive assortment of Wrought Spikes and Nails, from 3 to 10 inches, manufactured by the subscriber's Patent Machinery, which after five years successful operation, and now almost universal use in the United States, (as well as England, where the subscriber obtained a patent,) are found superior to any ever offered in market.

Railroad Companies may be supplied with Spikes having countersink heads suitable to the holes in iron rails, to any amount and on short notice. Almost all the Railroads now in progress in the United States are fastened with Spikes made at the above named factory—for which purpose they are found invaluable, as their adhesion is more than double any common spikes made by the hammer.

** All orders directed to the Agent, Troy, N. Y., will be punctually attended to.

HENRY BURDEN, Agent.
Troy, N. Y., July, 1831.

** Spikes are kept for sale, at factory prices, by I. & J. Townsend, Albany, and the principal Iron Merchants in Albany and Troy; J. I. Brower, 222 Water street, New-York; A. M. Jones, Philadelphia; T. Janviers, Baltimore; Degrand & Smith, Boston.

P. S.—Railroad Companies would do well to forward their orders as early as practicable, as the subscriber is desirous of extending the manufacturing so as to keep pace with the daily increasing demand for his Spikes. (1J23am) H. BURDEN.

FRAME BRIDGES.

THE undersigned, General Agent of Col. S. H. LONG, to build Bridges, or vend the right to others to build, on his Patent Plan, would respectfully inform Railroad and Bridge Corporations, that he is prepared to make contracts to build, and furnish all materials for superstructures of the kind, in any part of the United States, (Maryland excepted.)

Bridges on the above plan are to be seen at the following localities, viz. On the main road leading from Baltimore to Washington, two miles from the former place. Across the Metawaukeag river on the Military road, in Maine. On the national road in Illinois, at sundry points. On the Baltimore and Susquehanna Railroad at three points. On the Hudson and Patterson Railroad, in two places. On the Boston and Worcester Railroad, at several points. On the Boston and Providence Railroad, at sundry points. Across the Contoocook river at Henniker, N. H. Across the Souhegan river, at Milford, N. H. Across the Connecticut river, at Haverhill, N. H. Across the Contoocook river, at Hancock, N. H. Across the Androscoggin river, at Turner Centre, Maine. Across the Kennebec river, at Waterville, Maine. Across the Genesse river, at Squakiehill, Mount Morris, New-York. Across the White River, at Hartford Vt. Across the Connecticut River, at Lebanon, N. H. Across the mouth of the Broken Straw Creek, Penn. Across the mouth of the Cataraugus Creek, N. Y. A Railroad Bridge diagonally across the Erie, Canal, in the City of Rochester, N. Y. A Railroad Bridge at Upper Still Water, Orono, Maine. This Bridge is 500 feet in length; one of the spans is over 200 feet. It is probably the FIRMEST WOODEN BRIDGE ever built in America.

Notwithstanding his present engagements to build between twenty and thirty Railroad Bridges, and several common bridges, several of which are now in progress of construction, the subscriber will promptly attend to business of the kind to much greater extent and on liberal terms. MOSES LONG.

Rochester, Jan. 13th, 1837. 4—y

ARCHIMEDES WORKS.

(100 North Moor street, N. Y.)
NEW-YORK, February 13th, 1836.

THE undersigned begs leave to inform the proprietors of Railroads that they are prepared to furnish all kinds of Machinery for Railroads, Locomotive Engines of any size, Car Wheels, such as are now in successful operation on the Camden and Amboy Railroad, none of which have failed—Castings of all kinds, Wheels, Axles, and Boxes, furnished at shortest notice.

4—v1f H. R. DUNHAM & CO.

NEW ARRANGEMENT.

ROPES FOR INCLINED PLANES OF RAILROADS.

WE the subscribers having formed a co-partnership under the style and firm of Folger & Coleman, for the manufacturing and selling of Ropes for inclined planes of railroads, and for other uses, offer to supply ropes for inclined planes, of any length required without splice, at short notice, the manufacturing of cordage, heretofore carried on by S. S. Durfee & Co., will be done by the new firm, the same superintendant and machinery are employed by the new firm that were employed by S. S. Durfee & Co. All orders will be promptly attended to, and ropes will be shipped to any port in the United States.

12th month, 12th, 1836. Hudson, Columbia County State of New-York.

ROBT. C. FOLGER,
33—tf. GEORGE COLEMAN,

MACHINE WORKS OF ROGERS, KETCHUM AND GROSVENOR, Paterson, New-Jersey.

The undersigned receive orders for the following articles, manufactured by them, of the most superior description in every particular. Their works being extensive, and the number of hands employed being large, they are enabled to execute both large and small orders with promptness and despatch.

RAILROAD WORK.

Locomotive Steam-Engines and Tenders; Driving and other Locomotive Wheels, Axles, Springs and Flange Tires; Car Wheels of cast iron, from a variety of patterns, and Chills; Car Wheels of cast iron, with wrought Tires; Axles of best American refined iron; Springs; Boxes and Bolts for Cars.

COTTON WOOL AND FLAX MACHINERY,

Of all descriptions and of the most improved Patterns, Style, and Workmanship.

Mill Geering and Millwright work generally; Hydraulic and other Presses; Press Screws; Calliendors; Lathes and Tools of all kinds; Iron and Brass Castings of all descriptions.

ROGERS, KETCHUM & GROSVENOR
Patterson, New-Jersey, or 60 Wall street, N.
51tf

ALBANY EAGLE AIR FURNACE AND MACHINE SHOP.

WILLIAM V. MANY manufactures to order IRON CASTINGS for Gearing Mills and Factories of every description.

ALSO—Steam Engines and Railroad Castings of every description.

The collection of Patterns for Machinery, is not equalled in the United States. 9—1y

AN ELEGANT STEAM ENGINE AND BOILERS, FOR SALE.

THE Steam Engine and Boilers, belonging to the STEAMBOAT HELEN, and now in the Novelty yard, N. Y. Consisting of one Horizontal high pressure Engine, (but may be made to condense with little additional expense) 36 inches diameter, 10 feet stroke, with latest improved Piston Valves, and Metallic packing throughout.

Also, four Tubular Boilers, constructed on the English Locomotive plan, containing a fire surface of over 600 feet in each, or 2500 feet in all—will be sold cheap. All communications addressed (post paid) to the subscriber, will meet with due attention.

HENRY BURDEN.
Troy Iron Works, Nov. 15, 1836. 47—tf.

NOTICE TO CONTRACTORS. WESTERN RAILROAD.

PROPOSALS will be received at the office of the Western Railroad Corporation, in Springfield, until the 10th May, for the grading and masonry of the second and third divisions of the road, extending from East Brookfield to Connecticut river, at Springfield—a distance of 35 miles.

Plans, Profiles, &c. will be ready for examination after the first of May. W. H. SWIFT,
Resident Engineer.
Worcester, Mass., April 1, 1837. 14-6